

REMARKS/ARGUMENTS

Claims 12, 14-19, and 21-28 were examined in the Office Action of November 26, 2003. Claims 14 and 21-28 have been cancelled, without prejudice; claims 12 and 15-19 remain pending in the case.

As applied to the non-cancelled pending claims, claim 14 is rejected under 35 U.S.C. § 103(a) over *Cuchiario et al* (U.S. Patent No. 6,165,802) in view of *Chivukula et al* (U.S. Patent No. 6,146,905) and *Chu et al* (U.S. Patent No. 6,287,637). Claims 15-19 are rejected under 35 U.S.C. § 103(a) over *Cuchiario* in view of *Izuha et al* (U.S. Patent No. 6,060,735) and *Chu*.

Reconsideration and withdrawal of these rejections are respectfully requested in view of the following remarks.

A. Rejections of Cancelled Claims 14 and 21-28 Addressed.

The rejection of claims 14 and 21-28 is mooted by the cancellation of these claims.

B. Obviousness Rejection of Claim 12 over *Cuchiario*, *Chivukula* and *Chu* Addressed.

The rejection of claim 12 is respectfully traversed.

The present invention teaches and claims a method of fabricating a semiconductor device in a reduced total pressure environment including "crystallizing said ferroelectric film by applying a thermal annealing process in an O₂ atmosphere under a reduced total pressure in the range between 1 Torr and 40 Torr". Claim 12 is thus limited to an "O₂ atmosphere" and does not include inert gases such as Argon.

In contrast, *Chu et al* teaches the use of a reduced pressure environment at the time of crystallizing the sputtered PZT film using both an O₂ atmosphere as well as "another type of gas that will not react with PZT film" (column 7, line 15). Further, *Chu et al* teaches only the use of reduced oxygen "partial" pressure of 10⁻⁴ to 100 Torr since oxygen is being used in conjunction with a "second gas". Thus the oxygen partial pressure describes only the pressure related to the oxygen constituent and not the "total pressure" of oxygen as claimed.

There is no teaching or suggestion in *Chu et al*, nor in any combination of the cited references, of "crystallizing said ferroelectric film by applying a thermal annealing process in an O₂ atmosphere under a reduced total pressure in the range between 1 Torr and 40 Torr such that peeling of the ferroelectric film is substantially reduced" as claimed.

Accordingly, claim 12 is patentably distinguishable over the combination of cited references and allowable under 35 U.S.C. § 103(a).

C. Obviousness Rejection of Claim 15 Addressed.

The rejection of claim 15 is respectfully traversed.

Izuha et al teaches, in pertinent part, an epitaxial-like growth of the ferroelectric crystal (including PZT) and that the "uniformity" of the crystal grain of *Izuha et al* merely means that a single columnar crystal grain has a uniform grain diameter from the bottom part to the top part thereof (see column 5, lines 3-56). *Izuha et al* is entirely silent regarding the uniformity of the grain diameter between different columnar grains as claimed.

Claim 15 recites, in part, "a PZT ferroelectric film provided on said lower electrode, said PZT ferroelectric film having a columnar microstructure extending from an interface between said lower electrode and said PZT ferroelectric film in a direction substantially perpendicular to a principal surface of said lower electrode, said PZT ferroelectric film generally having a $\langle 111 \rangle$ orientation extending continuously from a bottom surface of said PZT ferroelectric film to a top surface of said PZT ferroelectric film and consisting of crystal grains generally having said $\langle 111 \rangle$ orientation and a substantially uniform grain diameter of less than about 200nm".

There is no teaching or suggestion in *Izuha et al*, nor in any combination of the cited references, of the uniformity between crystal grains as claimed.

For these reasons, claim 15 as amended is patentably distinguishable over the combination of cited references and is therefore allowable.

D. Dependent Claims.

Dependent claims 16-19 contain further limitations and are believed allowable as depending from allowable base claim 15. The case is now deemed to be in condition for allowance.

E. Conclusion.

For the reasons given above, all pending claims 12 and 15-19 are now believed to be in form for allowance and such action is respectfully requested.

Should the Examiner be of the opinion that a telephone conference would expedite the prosecution of this case, the Examiner is requested to contact Applicants' attorney at the telephone number listed below.

No fee is believed due for this submittal. However, any fee deficiency associated with this submittal may be charged to Deposit Account No. 50-1123.

Respectfully submitted,

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